

Requirements of the Expeditionary Strike Group's

Fixed Wing Aircraft

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To

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The concept of the F-35B, Short Take Off - Vertical Land (STOVL) variant of the Joint Strike Fighter (JSF) cannot be considered complete until the design of the aircraft is evaluated in light of the demands to be placed upon the aircraft and its crew during future expeditionary warfare. A review of the normal mission and the operational environment of the Expeditionary Strike Group (ESG) proves that expeditionary warfare demands more capability than the planned F-35B will be able to deliver. In order to operate effectively as the fixed wing tactical aircraft organic to the ESG, the F-35B must be capable of functioning in a strike coordination and reconnaissance (SCAR) role while simultaneously conducting escort and forward air controller airborne (FAC(A)) missions.

#### Employment of the ESG

Reviewing the normal mission of the ESG shows the requirements placed on its organic aircraft. The following example borrowed from the article *Expeditionary Strike Group! United States Naval Institute, Proceedings* illustrates the employment of the ESG. Picture a refugee evacuation operation on a modern battlefield with an opponent who poses land, air, and surface threats to hinder the evacuation. The Marine Expeditionary Unit (MEU), conducting crisis-action planning, prepares to conduct the evacuation. Concurrently, the ESG

Commander positions the cruiser and destroyer units and assigned submarine and P-3 assets to support strike operations. The ESG Commander supports strike operations while maintaining sea control, ESG defense, and ballistic missile defense. As soon as surface and air dominance are attained through strike targeting, the MEU employs organic aviation assets to begin the operation.<sup>1</sup> The example demonstrates how the varied components of the ESG can act quickly and in concert as a strategic task force. Two factors not detailed in the example that can adversely effect the ESG's operation are the following.

1- An ESG's area of influence has grown in direct proportion to the increased ranges of new assault support platforms. The areas traditionally assigned to the Amphibious Ready Group (ARG), and now to the ESG, extend farther inland from the coast\*.

2- The opposition's ability to affect friendly command and control systems (C2) has increased. "Several nations, including reported sponsors of terrorism, may currently have a capability

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\* The CH-46E Sea Knight has a maximum airspeed of 145 knots and with full fuel tanks can typically operate for 3 hours without requiring refueling. The maximum gross weight of a CH-46E is 24,300 pounds (empty weight approximately 16,000 pounds). - CH-46E Naval Air Training and Operating Procedures Standardization (NATOPS) Manual pp. 2-45, 4-8, 4-12. The MV-22 Osprey has a maximum airspeed of 257 knots and has a combat radius of 242 nautical miles. The maximum vertical takeoff weight of an Osprey is 52,600 pounds (empty weight approximately 33,459 pounds). - V-22 Naval Air Systems Command website. <http://www.navair.navy.mil>, accessed 13 February 2008

to use EMP [electromagnetic pulse] as a weapon ... to disrupt computers, communications systems, ...[and]... critical infrastructure."<sup>2</sup>

These two points illuminate an ESG requirement for aviation assets capable of both the coordination of deep fires and the timely integration and control of fires in close proximity to ground forces. The opposition can be defeated by the accuracy of deep and close fires and his threat of counter attack can be negated by our ability to raise our operational tempo if the ESG can operate independently. Our order of battle must afford the commander of the ESG responsive, forward assets for control and coordination.

#### The Expeditionary Strike Group

The ESG was conceived to support the National Military Strategy. ESGs provide a larger number of independent striking groups than Aircraft Carrier Strike Groups (CSGs) alone.<sup>3</sup> The ESG model is centered on a traditional amphibious ready group /Marine expeditionary unit (ARG /MEU) structure. The ARG/MEU consists of one large-deck amphibious assault ship (LHA or LHD), and two smaller landing ships (one LPD and one LSD) with an embarked MEU spread across the three ships. The ESG model adds;

two AEGIS surface combatants (CG or DDG), a third surface combatant (FFG or WHEC), one fast attack submarine (SSN) and additional staff personnel.<sup>4</sup> This reorganization includes "flexible and responsive options to a range of situations broader than the range appropriate for an ARG/MEU."<sup>5</sup> The ESG provides the strategic advantages of forward deployed deep strike, independent sovereignty, self-sustainability, speed and mobility, with the added bonus of "boots-on-the-ground" through embarked Marines.<sup>6</sup>

The Navy and Marine Corps have been focused on projecting strike power ashore with strategic visions like "...From the Sea," "Forward...from the Sea," and "Operational Maneuver from the Sea."<sup>7</sup> At times, these operations ashore will be in urban areas and not always in proximity to the coast.

As a forward deployed force, the ESG will be the first responder to developing crisis situations. As the first on scene, the ESG's operations will begin in an unshaped area of operations (AO). Determined by the type of mission and the location of the AO, preparation of the battle space is required to facilitate the execution of the mission. The ESG's current capabilities do provide a shaping ability. Naval surface fires, provided by the cruiser (CG) or destroyer (DDG), and the tactical aviation assets, the AV-8B and AH-1W aircraft within

the MEU's composite squadron, contribute to kinetic aspects of the shaping. However, these assets do come with limitations. Naval surface fires need accurate target coordinates and observers for shifting fires. The tactical aviation assets are antiquated and are currently planned for upgrade. The F-35B, replacing the AV-8B, is to be a more robust platform, with an increased combat range, ordnance load, and survivability<sup>†</sup>.

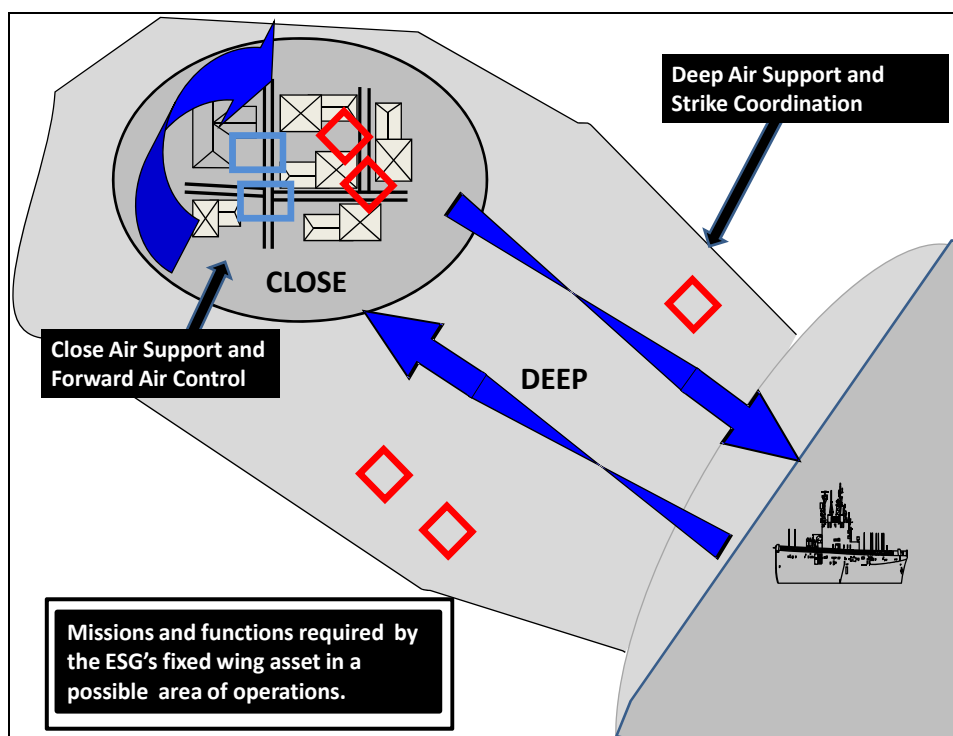
Ship-to-objective operations in a high threat environment

In the example provided consider the following specifics: the non-combatants are to be evacuated from an urban area which is significantly inland from the coast, and time allowed to complete this evacuation prohibits any effort to provide land dominance between the shore and this urban area. In this case the ESG's fixed wing tactical aircraft would take on certain requirements: first, to provide an escort to the assault support aircraft during the evacuation; second, to provide fire support for ground operations during the evacuation; third, to suppress the enemy in the unshaped battle space between.

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<sup>†</sup> The AV-8B has a combat radius of 300nm and has 7 weapons stations. The F-35B, as of Jun 07, is planned to have a radius of 450nm and 11 weapons stations. - "F-35 Lightning II: Anatomy of a 5TH Generation Fighter", Power Point Brief, Lockheed Martin (June, 2007)

The MV-22 is a MEU assault support aircraft capable of the mission outlined in the example. The MV-22, however, does not have sufficient weaponry for self protection. Therefore, the ESG's fixed wing tactical aircraft must provide an escort to these assault support aircraft.



Second, the ESG's fixed wing tactical aircraft should be a fully capable FAC(A) platform. Providing fire support in close proximity to the friendly forces requires detailed integration and control of fires provided normally by a forward air controller (FAC) within the ground control element (GCE).<sup>8</sup> However, there are circumstances when this FAC is unable to



fulfill his controller role. A FAC is unable to function as a controller while en route due to lack of situational awareness of the battlefield. Also, a FAC initially will have limited situational awareness once on the objective. The FAC(A) provides the continuity of observation and communication to bridge this gap in control.<sup>9</sup>

Third, the ESG's fixed wing tactical aircraft should be able to execute SCAR. In the example, limited intelligence about the enemy's location and disposition in the deep area is available. In order to suppress the enemy in the deep area, the ESG's fixed wing tactical aircraft should be able to survey the deep battle space and coordinate target attacks within it. The SCAR mission is designed to provide this ability.<sup>10</sup> These three functions (escort, FAC(A), and SCAR) pose a significant workload if performed simultaneously by one platform.

Added to the workload required by those three functions is the friction of limited C2 due to emerging threat capabilities. The military's weapons and C2 systems have grown exponentially in complexity over the past few decades. As the system becomes more complex, the vulnerability to the effects of EMP also grows.<sup>11</sup> The vulnerability is pointed out by the Congressional Research Service report:

"Studies related to the effects of electromagnetic weapons have been published infrequently, or remain classified. Nevertheless, it is known that a powerful HEMP [High-Altitude Electromagnetic Pulse] field as it radiates outward can interfere with radio frequency links and disrupt electronic devices thousands of miles from (its generation)"<sup>12</sup>

Certain types of HEMP weapons are small, relatively low in technological complexity, and within the capability of many non-state organizations.<sup>13</sup> With this threat the F-35B has many requirements to meet.

#### F-35B STOVL JSF

The F-35B is among the first of the 5<sup>th</sup> generation of strike fighters. The airframe will have similar aerodynamic performance to the F-16 and F/A-18C, and increased survivability due to a stealth signature. This stealth is provided, in part, by low radar cross-section and advanced radar countermeasures. In mission performance, advanced avionics, improved data links, and adverse weather precision targeting are significant improvements. The combat range, fuel, and weapons load is comparable to the F-16 and F/A-18C.

The F-35B incorporates improved lethality and survivability, integrating the advances in technology over the past decade. Most significant among these advances are the F-35B's forecasted abilities to collect and to distribute information. The F-35B will have advanced sensors onboard

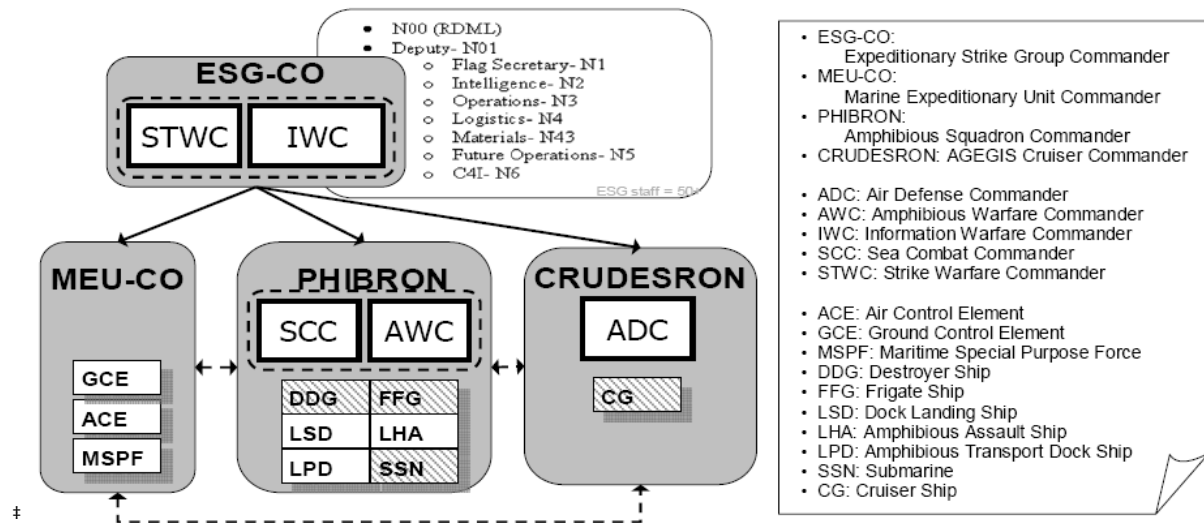
providing improved target acquisition in all weather conditions. Two of these systems are the advanced electro-optical targeting system (EOTS) and the advanced electronically scanned array (AESA) radar.<sup>14</sup> The F-35B will be connected to C2 platforms via multiple voice communication channels, data-links such as Link-14 and Link-16 and satellite communication. The F-35B will also have its own proprietary link for targeting and threat information dissemination inter-flight.<sup>15</sup> Its ability to gather, use and share information provides the commander a technological advantage on the battlefield.

#### Shortfall to the net-centric environment

Can the ESG rely on the information collection and distribution ability of the F-35B alone, therefore negating the need for a SCAR mission and a FAC(A) capable platform? Advances in technology continue to increase the flow of information across the battle field. This emerging net-centric environment will increase the ability to coordinate and integrate operations. This cooperation will increase lethality and decrease the time required to accomplish the set mission. However increased information flow is not equal to an increased situational awareness. This is a shortfall of the F-35B.

Understanding the information provided and interpreting it correctly in order to build a correct operational picture is an

essential step in mission execution. For the ESG, this consolidation and interpretation is done at three C2 nodes. The commander at each makes a decision based on the information and the result is distributed via the C2 network<sup>‡</sup>. This process is dependent on throughput of information. However, in light of present threats, this connectivity should not be relied upon.



"An ESG organization ... places the Amphibious Squadron Commander (PHIBRON) - the first C2 node - to fill the dual roles of an Amphibious Warfare Commander (AWC) and a Sea Combat Commander (SCC). This structure puts the Commander of the AEGIS Cruiser (CG-CO/CRUDESRON) - the second C2 node - to assume his traditional role as an Air Defense Commander (ADC), and the MEU commander (MEU-CO) - the third C2 node - to assume the role of a Principal Warfare Commander. . . In order to successfully execute a wide range of missions, the ESG C2 structure assumes a hybrid(adaptable and hierarchical) form. The fixed and dynamic (changing) C2 relationships are denoted as the straight and dashed lines in [the figure], respectively. The dynamic C2 relationships stem from the S-S [supporting- supported] structure within the ESG, wherein the commanding C2 nodes (supported) and the supporting (commanded) roles are interchangeable, and are typically task-dependent." - Candra Meirina, Feili Yu, Krishna R. Pattipati, David L. Kleinman, Model-Based Organization Analysis and Design for an ESG Organization, Connecticut University Stores Department of Electrical Engineering and Computer Science, June 01 2006,3-5. <http://stinet.dtic.mil/> (accessed February 13, 2008).

If there is a break down in the flow of information, an intermediate platform should be able to fill the role as processor and controller. The F-35B system, while able to gather more information and to present more information to the pilot, must rely upon that same pilot to prioritize immediate threats, to determine appropriate tactical responses available, to select options, and to make calculations needed to execute an ordered set of responses while performing diverse roles, such as armed reconnaissance, and FAC(A).<sup>16</sup> Other agencies or platforms, in or out of the ESG, will not reliably overcome time, space, and the threats to C2 to supply what the F-35B lacks in tactical air direction capability.

## Conclusion

The ESG, in order to successfully function as an independent quick-reaction task force, requires an aviation asset that can simultaneously function in a SCAR role while providing both FAC(A) and escort capabilities. As currently planned, I believe the F-35B lacks this ability especially in a battlefield where the ESG's C2 network is reduced.

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